

Abstract for GR-TR Conference on Statistical Mechanics and Dynamical Systems

Plenary Invited

Invited Talk

Superstatistical techniques for complex systems with time scale separation

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Many complex driven nonequilibrium systems are effectively described by a superposition of several statistics on different time scales, in short a ‘superstatistics’. Superstatistical techniques have been successfully applied to a variety of complex systems, for example turbulence (Lagrangian, Eulerian, environmental), hydroclimatic fluctuations, pattern formation, mathematical finance, traffic delay statistics, random matrix theory, networks, scattering processes in high energy physics, cancer survival statistics, and foraging animals. In medical and biological applications superstatistics often arises out of the fact that populations are heterogeneous, in this way complexity arises out of the mixing of simple Markov processes at individual level. In this talk I will first give a general overview of the superstatistics concept and its recent applications. I will then explain how to extract the relevant superstatistical parameters out of a given experimentally measured time series. Finally I will show how to formally map superstatistics onto a complicated equilibrium statistical mechanics by means of an exotic effective Hamiltonian.

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- [2] C. Beck, Contemp. Phys. 50, 495 (2009)
- [3] C. Beck, Eur. Phys. J. A 40, 267 (2009)
- [4] E. Van der Straeten, C. Beck, arXiv:0911.4816